

REMARKS

Claims 1-15 are pending, with claim 1 being independent. Applicants have proposed to amend claims 1, 4, 9, and 13 to 15, mostly to clarify the language and to correct typographical errors. Support for these amendments can be found in the originally-filed specification, e.g., at page 3, lines 21-23, and in Figs. 1-3. No new matter would be added if the Examiner were to enter these amendments. In particular, as shown in FIGs. 1 to 3 by the horizontal arrow, pumping light (3) is coupled into the solid body (2) through only the end surface (4) and then propagates transversely within the solid body and is transmitted into the annular gap (6) through the lateral surfaces (7). Furthermore, the proposed claim amendments would raise no new issues and require no additional searching by the Examiner, and instead would place the claims into condition for allowance or at least put the claims into better condition for appeal.

Applicants acknowledge the Examiner's conclusion that claims 3 and 6 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. However, in view of the comments below and the proposed amendments, applicants believe that all of the pending claims are allowable.

35 U.S.C. § 103

Claims 1, 2, 4, 5, 7, and 13-15 have been rejected as being allegedly "anticipated"¹ by Byren (U.S. Patent No. 6,014,391) in view of Tidwell (WO 93/23899). Applicants traverse this rejection for the following reasons.

According to the Office Action (at page 3), with respect to claims 1-2,

Byren teaches an apparatus for optically pumping a laser-active solid body with pumping light coupled into the solid body through an end surface of the solid body (fig.1), the apparatus comprising: a laser-active solid body (fig.1 #4) including an end surface through which pumping light is coupled into the solid body (fig.1 #4 right side) and a lateral surface through which pumping light exits the solid body (fig.1 #4, top and bottom lateral surfaces); a reflector surrounding the laseractive solid body at a distance from the lateral surface of the solid body for reflecting light that exists [sic, exits] the solid body back towards the solid body (col.5 lines 56-58, coating); thereby forming an annular gap between the

¹ The Office Action at page 3 states "anticipation" but applicants assume the Examiner meant "rendered obvious."

solid body and the reflector (gap formed between body #4 and reflecting surface #5, gap filled with material #3).

The Office concedes that, "Byren does not teach a surface for diffusing light," but notes that "Tidwell discloses an end pumped solid state laser with a surface (lateral) for diffusing light (pg.5 lines 1-6 coating, or roughed surface pg.5 lines 8-10)." The Office then concludes, "it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the end pumped laser of Byren with the end pumped system with diffusely functional coating, or roughed laser media of Tidwell in order to more evenly distribute pumping radiation within the lasing medium (Tidwell, pg.5 lines 1-6)" (Action at page 3).

Applicants respectfully disagree, because there is simply no suggestion or motivation to combine Byren with Tidwell, and more importantly, the proposed combination would render Byren's slab laser pump cavity design inoperative.

Byren uses hyperboloid cylindrical reflective surfaces 5 to ensure a substantially uniform pump energy distribution throughout the width of the active region 4 although the pump intensity decreases towards the center of active region 4 (see, Fig. 1 and col. 5, line 56, to col. 6, line 4). The hyperboloid cylindrical surfaces 5 have high reflectivity to ensure a convergent propagation of the pump energy towards the center of active region 4 (col. 5, lines 56-65). If the hyperboloid cylindrical surfaces 5 instead were diffuse, as the Office proposes, the pump light would not be compressed to the center of the active region 4 as shown in Fig. 1, but would be distributed diffusely without achieving the desired uniform pump energy distribution throughout the width of the active region 4. Therefore, one of skill in this field would not use a diffuse surface as disclosed in Tidwell in Byren's device, because the combination would defeat the purpose of Byren's design.

Furthermore, in Byren some of the pumping light is transversely coupled into the active region 4 through the side surface of the active region 4 (see, e.g., FIG. 2), and not through only the end surface of the laser active medium 4 as recited in claim 1. The Office Action notes that Tidwell uses a diffuse reflective coating 8 to provide more uniformity of the pumping radiation within the lasing medium 4 (Fig. 1 and page 5, lines 2-6). However, Tidwell's diffuse coating

would not help in the particular design disclosed in Byren, because it would interfere with the precise hyperbolic curve of Byren's design.

In addition, in Tidwell, the side surface 8 of the lasing medium 4 reflects the pump photons by substantially total internal reflection or with the application of suitable reflective surface coatings of the side surface 8 (page 2, lines 20-24 and page 5, lines 11-14). Therefore, Tidwell fails to disclose pumping light diffusely through the side surface 8 out of the lasing medium 4 and fails to describe an annular gap between a solid body and a reflector. For these additional reasons, it would not have been obvious for one of skill in this field to combine the Byren and Tidwell applications.

Dependent claims 2, 4, 5, 7, and 13-15 are patentable for at least the same reasons as independent claim 1, because "[d]ependent claims are nonobvious under section 103 if the independent claims from which they depend are nonobvious." In re Fine, 5 U.S.P.Q.2d 1596, 1600 (Fed. Cir. 1988). Thus, the combination of Byren and Tidwell does not render claims 1, 2, 4, 5, 7, or 13-15 obvious, and applicants respectfully request that the Examiner reconsider and withdraw this rejection.

Next, the Office Action rejects claims 8-10 as being allegedly unpatentable over Byren in view of Tidwell and Honea et al. (U.S. 2002/0118718).

With respect to claim 8, Byren and Tidwell allegedly describe an apparatus including a medium disposed on the outside of a lateral surface, but clearly fail to disclose the medium to be of a higher refractive index. The Office Action notes that Honea describes "a solid state pumping apparatus that uses a medium of high refractive index ([0006])," and concludes that "[i]t would have been obvious to one of ordinary skill in the art at the time of the invention to combine the apparatus of Byren and Tidwell with the index difference of Honea to suppress parasitic oscillations in the active media (Honea, [0006])" (Action at page 5). Applicants disagree for the following reasons.

First, applicants submit that claims 8 to 10 are patentable for at least the same reasons that claim 1 is patentable as discussed above, and that Honea fails to supply any further support for the combination of Byren and Tidwell.

Second, Honea relates to a laser 20 having a laser slab 22, a lens duct 23 that delivers pump light from a diode array 24 to the laser slab 22, and an intermediate beam extractor 26 between the lens duct 23 and the laser slab 22 (see Honea at paragraph 0020 and Fig. 1). The pump light is delivered to an end 21 of the laser slab 22 through a highly reflecting dichroic coating (see Honea at paragraph 00202 and Fig. 1). The laser slab 22 may be coated on its sides with a multi-layer coating that results in low reflection losses for low-angle light rays (at paragraph 0027 and Fig. 5). However, while Honea describes a multi-layer coating around a side of the laser slab 22, Honea's multi-layer coating is not at a distance from the side of the laser slab 22 in such a manner as to form an annular gap between the laser slab 22 and the multi-layer coating. Rather, the multi-layer coating is on one or more sides of the laser slab (at paragraph 0027 and Fig. 5). For at least these reasons, claims 8-10 are allowable over any possible combination of Byren, Tidwell, and Honea.

Next, the Office has rejected claims 1 and 11-12 as being allegedly unpatentable over Hanson (U.S. H1,673) in view of Byren in view of Tidwell. Applicants traverse this rejection for the following reasons.

With respect to claims 1, 11, and 12, the Action asserts that Hanson describes (at page 6):

an apparatus for optically pumping a laser active solid body with pumping light coupled through an end surface of the solid body, comprising: a laser active body (fig.2 #10) including an end surface through which pumping light is coupled (fig.2 #10 left side) into the solid body and a lateral surface through which pumping light exits the solid body (fig.2 top and bottom of #10, some light inherently lost through lateral surfaces), a housing surrounding the laser active solid state body at a distance from the lateral surface of the solid body for housing cooling fluid (water, col.3 lines 1-3), thereby forming an annular gap between the solid body and the housing.

The Office admits that, "Hanson does not teach the housing surface to be

reflective or diffusive” (at page 6), but states that Byren describes a solid media with reflective coated housing walls and that Tidwell describes the use of a diffusive coating. The Action then concludes, “it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the housing of Hanson with the reflective coating of Byren to return lost light to the active media, and additionally to make the coating diffusive, as taught by Tidwell, in order to more evenly distribute the pumping light to the active material” (Action at page 6). However, as noted above, Byren and Tidwell cannot properly be combined, and if combined, the combination would counteract the benefits of Byren’s design. Hanson fails to provide any additional support for combining Byren and Tidwell, and thus, fails to render claims 1, 11, or 12 obvious.

In particular, Hanson discloses a cooling ring 218 between gain element 10 and cooling jacket 202 for a coolant. According to col. 2, lines 62-64, the cooling jacket 202 is arranged so that pumping radiation 206 does not have to pass through the coolant. Therefore, Hanson neither discloses pumping light diffusely through the side surface out of the lasing medium 10 nor that the housing surface of the cooling ring 218 is reflective or diffuse. One of ordinary skill in the art would not have been motivated by any of the cited references to combine Byren, Tidwell, and Hanson as the Office suggests. Therefore, absent such motivation, the Office has failed to establish a *prima facie* case of obviousness, and applicants respectfully request the Examiner to reconsider and withdraw the rejection of claim 1, and its dependent claims 11 and 12, in view of Byren, Tidwell, and Hanson.

Applicant : Malte Kumkar et al.
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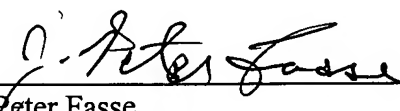
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CONCLUSION

Applicants request that the Examiner accept and enter the proposed amendments and reconsider withdraw the remaining rejections. Please apply any charges or credits to deposit account 06-1050, referencing Attorney Docket No. 15540-020US1.

Respectfully submitted,

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